

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An optical system comprising a diffraction element ~~(2; 102; 202; 302)~~ formed of a substantially rigid first material having a first refractive index, the diffraction element having:

a) a first plurality of grooves ~~(4; 104; 226)~~ at a first interface of the diffraction element with a second material ~~(8; 108; 208)~~ having a second refractive index; and

b) a second, differently proportioned, plurality of grooves ~~(6; 106; 228)~~ at a second, different, interface of the diffraction element with a third material ~~(10; 110; 210)~~ having a third refractive index,

wherein the first and second pluralities of grooves are aligned with respect to each other such that a combined diffractive

effect is achieved,

~~characterised in that wherein~~ the third material ~~(10; 110; 210)~~ is a liquid, and wherein widths of the first plurality of grooves vary from an edge to a center of the diffraction element.

2. (Currently Amended) ~~An~~ The optical system according to claim 1, wherein said first plurality and said second plurality of grooves ~~(4; 104; 226), (6; 106; 228)~~ are blazed and arranged to select a desired diffraction order of a given input radiation.

3. (Currently Amended) ~~An~~ The optical system according to claim 1, wherein said first plurality of grooves have a first depth (d1), said second plurality of grooves have a second, different depth (d2), and wherein said first and second depths are different to each other.

4. (Currently Amended) ~~An optical system according to claim 3,~~  
An optical system comprising a diffraction element (2; 102; 202; 302) formed of a substantially rigid first material having a first refractive index, the diffraction element having:

a) a first plurality of grooves (4; 104; 226) at a first interface of the diffraction element with a second material (8; 108; 208) having a second refractive index; and

b) a second, differently proportioned, plurality of grooves (6; 106; 228) at a second, different, interface of the diffraction element with a third material (10; 110; 210) having a third refractive index,

wherein the first and second pluralities of grooves are aligned with respect to each other such that a combined diffractive effect is achieved,

wherein the third material is a liquid,

wherein said first plurality of grooves have a first depth (d1), said second plurality of grooves have a second, different depth (d2), and wherein said first and second depths are different to each other, and

wherein said grooves are arranged to ~~fulfil~~fulfill the following relation:

$$-(n_1 - n_2)d_1 + (n_1 - n_3)d_2 = m\lambda_n$$

wherein, n1, n2 and n3 are the first, second and third

refractive indices respectively,  $d_1$  and  $d_2$  are the first and second depths respectively,  $m$  is a desired diffraction order and  $\lambda_n$  is a wavelength of the given input radiation.

5. (Currently Amended) ~~An~~ The optical system according to claim 4, wherein the given radiation beam comprises a plurality of different wavelengths  $\lambda_n$  and the grooves are arranged such that a diffraction efficiency  $\eta$  is substantially ~~maximised~~ maximized for each of said different wavelengths  $\lambda_n$ , the efficiency  $\eta$  for each of said different wavelengths  $\lambda_n$  of the given input different radiation beam being given using the following relation:

$$\eta = \left( \frac{\sin \left[ \frac{\pi(-(n_1 - n_2)d_1 + (n_1 - n_3)d_2)}{m\lambda_n} - \pi \right]}{\frac{\pi(-(n_1 - n_2)d_1 + (n_1 - n_3)d_2)}{m\lambda_n} - \pi} \right)^2$$

6. (Currently Amended) ~~An~~ The optical system according claim 1, wherein said first plurality and said second plurality of grooves ~~(4; 104; 226), (6; 106; 228)~~ are arranged concentrically about an optical axis (OA).

7. (Currently Amended) ~~An~~ The optical system according to claim 1, wherein widths of said coinciding pairs are substantially the same, said widths being in a direction perpendicular the optical axis.

8. (Currently Amended) ~~An~~ The optical system according to claim 1, wherein the second material has a given optical dispersion and the third material has a different optical dispersion.

9. (Currently Amended) ~~An~~ The optical system according to claim 1, wherein said second material is a fluid.

10. (Currently Amended) ~~An~~ The optical system according claim 9, wherein said second material is a gas ~~(8; 108; 208)~~.

11. (Currently Amended) ~~An~~ The optical system according to claim 1, wherein said system is arranged to modify a configuration of said third material using electrowetting forces.

12. (Currently Amended) A method of manufacturing an optical system comprising a diffraction element ~~(2; 102; 202; 302)~~ formed of a substantially rigid first material having a first refractive index, the diffraction element, when manufactured, comprising:

a) a first plurality of grooves ~~(4; 104; 226)~~ at a first interface of the diffraction element with a second material ~~(8; 108; 208)~~ having a second refractive index; and

b) a second, differently proportioned, plurality of grooves ~~(6; 106; 228)~~ at a second interface of the diffraction element with a third material ~~(10; 110; 210)~~ having a third, different, refractive index,

wherein the first and second pluralities of grooves are aligned with respect to each other such that a combined diffractive effect is achieved,

the method comprising the acts of:

applying said second material to said first plurality of grooves, and

~~characterised in that the method comprises~~ applying said third material ~~(10; 110; 210)~~ to said second plurality of grooves as a liquid,

wherein widths of the first plurality of grooves vary from an  
edge to a center of the diffraction element.